The Effects of Study Skills Training and Peer Coaching of ‘At-Risk Students’ on Retention and Passing Rates in a Remedial Mathematics Course

Final Report

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Summary of Background and Method

The aim of this project was to implement a multifaceted and differentiated approach to improving passing rates and reducing attrition rates in Elementary Algebra in a community college setting. Our approach involved:

- Incorporating the teaching of study skills, time management strategies, test-taking skills, and anxiety reduction strategies into the Elementary Algebra course.
- Identifying students at high-risk of failure or dropout at the beginning of the semester.
- Assigning peer coaches to high-risk students to help them pass the course.
- Extensive training of instructors and coaches.

Our specific objective was to implement and test an intervention model that would affect the maximum possible number of students in each participating section. Our research hypothesis was that incorporating study skills training and anxiety reduction strategies in the Elementary Algebra course and providing additional counseling, peer mentoring, and tutoring for at-risk students would result in improved student persistence and higher passing rates in Elementary Algebra. The independent variables in our study were:

- Study skills training
- Test-taking skills training
- Time management skills training
- Math anxiety reduction
- Test anxiety reduction
- Tutoring and mentoring (coaching) to reinforce skills taught in class and provide personalized assistance to at-risk students

The dependent variables were:

- Course pass rates
- Student retention rates in the course
- End-of-semester pass rates

Background and Significance

Research has documented that only about 25% of the variation in students’ performance is attributable to the quality of teaching of the subject matter; another 25% is explained by affective variables such as attitudes, study habits and skills, dispositions, and math and test anxiety (Bloom, 1976; Nolting, 2008), with the remaining 50% attributable to cognitive entry skills (aptitude and prerequisite knowledge of the subject). According to Nolting, students’ affective characteristics are the most neglected area in colleges today.
Our challenge was to find an effective way of reaching out to all students, including high-risk students. We believed that teaching study skills in the classroom only is not enough to make a difference for all students. At-risk students need additional support; they might benefit from having a mentor, a personal tutor, and someone who will monitor their attendance, time management, homework completion, acquisition of study skills, and preparation for examinations. This additional assistance was offered by trained peer coaches.

Research design

Participants and Setting

Participating students were BMCC students taking MAT 051, Elementary Algebra, in the Fall 2010 semester. MAT 051 is a remedial, non-credit course. Five instructors were randomly selected to participate. One section taught by each instructor was randomly assigned to the experimental condition and the other section assigned to the control condition.

To identify at-risk students three instruments were used: a survey, a diagnostic arithmetic test, and instructor observations. The survey was designed to assess a number of risk factors, including academic background, motivation, study skills, and math and test anxiety. The diagnostic arithmetic test was comprised of ten multiple-choice problems covering such topics as whole numbers, fractions, decimals, and percents. Instructor observations included class attendance, timely report to class, homework completion, and the extent of participation in class activities. Depending on their performance on the above instruments students were awarded risk points. Each instrument carried a maximum of two risk points. Consequently, students’ aggregate risk score could vary from zero to six, six being the highest possible risk score. Students with the risk score of three or higher were classified as at-risk of course failure and were offered coaches.

Independent and Dependent Variables

The independent variables in the study included the intervention administered in the experimental classroom, consisting of study skills training, time management instruction, and math and test anxiety desensitization. These were integrated with the elementary algebra instruction throughout the course. Within these sections, students identified as “at-risk” received supplementary coaching sessions that reinforced these skills through tutoring and mentoring.

The dependent variables were the end-of-semester pass rates, course pass rates, and student retention in the course.

Design and Procedure

Participating faculty attended a pre-semester training workshop delivered by a study-skills and a time management expert. Coaches attended a training session including a case study analysis of how to work with students.
Coaches were instructed to meet with their protégés at least once a week for a minimum of one hour to discuss progress, review homework, and help prepare for tests and quizzes. Coach duties also involved assisting their protégés in building strong study skills and developing effective time management strategies. Coaches were compensated for their activities.

**Findings**

The data shows that (1) the retention rate was significantly higher in the treatment groups \( p = 0.01299 \), see Figure 1; (2) the passing rate was higher for the treatment groups, but not significantly so \( p = 0.3013 \), see Table 1; (3) our diagnostic test successfully identified at-risk students \( p = 0.0021 \), see Figure 2; (4) the overall passing rate for coached students was significantly higher than for those who were not assigned coaches when adjusted for risk scores \( p = 0.03356 \), see Figure 3.

**Table 1.**

<table>
<thead>
<tr>
<th>Professor (group)</th>
<th>Number of students</th>
<th>Number passed (%)</th>
<th>Number failed (%)</th>
<th>Number incomplete (%)</th>
<th>Number withdrawn (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (treatment)</td>
<td>26</td>
<td>3 (11.5%)</td>
<td>20 (76.9%)</td>
<td>3 (11.5%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>1 (control)</td>
<td>24</td>
<td>8 (33.3%)</td>
<td>9 (37.5%)</td>
<td>4 (16.6%)</td>
<td>3 (12.5%)</td>
</tr>
<tr>
<td>2 (treatment)</td>
<td>26</td>
<td>9 (34.6%)</td>
<td>13 (50.0%)</td>
<td>3 (11.5%)</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td>2 (control)</td>
<td>25</td>
<td>7 (28.0%)</td>
<td>7 (28.0%)</td>
<td>5 (20.0%)</td>
<td>6 (24.0%)</td>
</tr>
<tr>
<td>3 (treatment)</td>
<td>26</td>
<td>4 (15.4%)</td>
<td>8 (30.8%)</td>
<td>6 (23.1%)</td>
<td>8 (30.8%)</td>
</tr>
<tr>
<td>3 (control)</td>
<td>27</td>
<td>10 (37.0%)</td>
<td>6 (22.2%)</td>
<td>2 (7.4%)</td>
<td>9 (33.3%)</td>
</tr>
<tr>
<td>4 (treatment)</td>
<td>27</td>
<td>16 (59.2%)</td>
<td>2 (7.4%)</td>
<td>4 (14.8%)</td>
<td>5 (18.5%)</td>
</tr>
<tr>
<td>4 (control)</td>
<td>27</td>
<td>14 (51.9%)</td>
<td>4 (14.8%)</td>
<td>3 (11.1%)</td>
<td>6 (22.2%)</td>
</tr>
<tr>
<td>5 (treatment)</td>
<td>24</td>
<td>15 (62.5%)</td>
<td>0 (0.0%)</td>
<td>6 (25.0%)</td>
<td>3 (12.5%)</td>
</tr>
<tr>
<td>5 (control)</td>
<td>25</td>
<td>3 (12.0%)</td>
<td>4 (16.0%)</td>
<td>10 (40.0%)</td>
<td>8 (32.0%)</td>
</tr>
<tr>
<td>Totals (treatment)</td>
<td>129</td>
<td>47 (36.4%)</td>
<td>43 (33.3%)</td>
<td>22 (17.1%)</td>
<td>17 (13.2%)</td>
</tr>
<tr>
<td>Totals (control)</td>
<td>128</td>
<td>42 (32.8%)</td>
<td>30 (23.4%)</td>
<td>24 (18.8%)</td>
<td>32 (25.0%)</td>
</tr>
</tbody>
</table>

Note: the treatment sections achieved an overall 36.4% passing rate versus the 32.8% passing rate of the control sections. Also note that the overall attrition (withdrawal) rates for the treatment sections (13.2%) is lower than the attrition rate for the control sections (25.0%).

**Suggestion for Related Research**

We suggest an alternative model for coaching. In particular, instead of coaches working with protégées one-on-one, students will be organized into heterogeneous groups, not limited to at-risk students. It appears that some lower-risk students could also benefit from a relationship with a coach. Some

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students in the experimental sections asked for a coach but could not be awarded one due to their risk point score, and some of these students went on to fail the course. Some at-risk students might also benefit from working with more successful students in the class.

Figure 1

Retention Results

Retention Proportions

Statistical Analysis: RESULTS ARE SIGNIFICANT EVIDENCE THAT THE TREATMENT INCREASES RETENTION RATES

p-value = 0.01299 (2x2x5 Exact Test, Combinatorial)
### Diagnostic Test: All Students

**The Diagnostic Test we developed works**

Passing Rates vs. Total Risk Points.

Aggregate data:

- 45% of students diagnosed as low-risk passed the class.
- 24% diagnosed as high-risk passed class.

Statistical Analysis: High Risk Students (4+ total risk points) have a lower passing rate ($p=.0021$). Method: 2-sample test for equality of proportions with continuity correction.

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### Peer Coaching (mentoring) works.

Statistical Analysis: Peer Coaching Increase Pass Rates ($p = 0.03356$)

(2x2x4 Cochran-Mantel-Haenszel Test for Count Data, Exact Test, Combinatorial)
We also suggest a way to fine-tune the process of matching coaches with protégées and of managing the coach-protégé relationship. Many coaches found their assigned protégées to be unreliable with respect to arranging meetings. In future projects, there should be stricter guidelines on the responsibilities of protégées, and those protégées who do not satisfy the guidelines, i.e., fail to show up for appointments, should be replaced by new protégées.

**References**
